

Fig.1

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Address http://www.atl.com/ATLLearningCenter/OnlineCaseStudies/Vascular/vascintro.asp



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## Case Studies

Vascular

These case studies have been approved by the Society of Diagnostic Medical Sonographers for 1.0 credit. These credits are accepted for laboratory accreditation and are accepted by the ARDMS, AART (Category A), and AMA (Category II).

### Vascular Case Study #1 - Carotid Body Tumor

Darrin Cournoyea, BSc, RDMS, RVT  
Peterborough Vascular Lab, Peterborough, Ontario, Canada

### Vascular Case Study #2 - Right Popliteal Artery False Aneurysm with an Arterial-Venous Fistula

Darrin Cournoyea, BSc, RDMS, RVT  
Peterborough Vascular Lab, Peterborough, Ontario, Canada

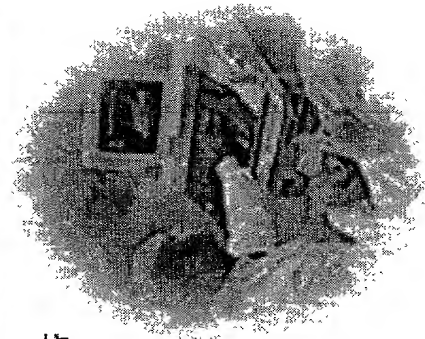



Fig. 2

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The following learning exercise provides information regarding Carotid Body Tumor. The information is presented using a case study format. By reviewing the medical history and test results of several diagnostic modalities, the characteristics of the pathology are examined.

Following the review of this information as well as the discussion provided in the library the learner will be able to:

1. Describe the role of ultrasound in the assessment of carotid body tumor.
2. List the typical ultrasound findings of carotid body tumor.
3. Describe the typical signs and symptoms of carotid body tumor.
4. List other pathologies that may be considered as a differential diagnosis for carotid body tumor.

At any time the personal notes button can be used to collect information regarding the pathology. These notes can then be printed as a summary of the case study for future reference. All practitioners of ultrasound can benefit from this case study review which illustrates the unique information that each imaging modality, clinical exam or test provides to reach a diagnostic conclusion.

The patient chart tabs above allow access to all test results. Please click on one to begin the case study review. When you feel you have collected adequate information from the test results and library please proceed to the test.

Fig. 3



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Laboratory/Pathology Nuclear Medicine X-Ray MRI Angiography Ultrasound Computed Tomography

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#### Examination Report- Cerebral Angiography

The study was carried out from a right femoral puncture and no complications were encountered. At the end of the procedure, the patient had noticed some numbness in the right foot. This actually had occurred during the examination, fairly early on and this was likely due to a partial anesthesia of the femoral nerve.

The patient developed a bit of numbness in the right hand, predominantly in the third periphery of the digits towards the end of the procedure. This may have been related to spasm in the left vertebral artery, which did occur during the examination. It is possible that a small embolus occurred during catheterization of the left cerebral vessels, but her vessels are quite smooth and the catheterizations went quite easily. In any case, both of these symptoms were resolving as the patient was being observed in the surgical outpatient unit.

Selective right carotid and right vertebral angiography revealed relatively normal vessels. In particular, there was no collateral flow from branches of these vessels over to the lesion adjacent to the left carotid bifurcation.

Selective left vertebral angiography did not reveal any abnormalities or supply to the above mentioned left carotid bifurcation tumor.

Fig. 5

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## Pathology Report

### Pathology Report of Left Neck Mass

**Gross:** The specimen is submitted in a single container and consists of a fleshy burgundy colored portion of tissue measuring up to 1.5 x 1.1 x 0.8 cm. Tissue weighs 1.0 gm. On sectioning, a firm kidney-bean shaped area is present measuring 1.1 x 0.7 cm. The cut surface is tan/red in color.

**Microscopic:** Sections show a well circumscribed encapsulated lesion surrounded by fibrovascular stroma. The lesion appears to be completely excised.

It consists predominantly of cords of cells in a markedly vascular stroma. The cells have oval to irregular nuclei with finely granular chromatin and small nuclei. Zellballen pattern is focally evident.

### DIAGNOSIS: CAROTID BODY TUMOR (PARAGANGLIOMA)

### Blood and Urinalysis Laboratory Results

**Blood Results**

Result Reference Range

**Urinalysis Results**

Result Reference Range

1517

Fig. 6



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TEST	
Question 1	<p>The following test is multiple choice. Select the answer for each question by clicking on the button preceding your choice. A passing score is 70% correct answers.</p> <p>The vascular area demonstrated with the angiogram at the left carotid bifurcation would most likely be fed by?</p> <p> <input type="radio"/> Branches off the internal carotid artery  <input type="radio"/> Branches off the external carotid artery  <input type="radio"/> Branches off the vertebral artery  <input type="radio"/> Branches off the thyrocervical artery                 </p>
Question 2	<p>The carotid body tumor is typically located between the</p> <p> <input type="radio"/> vertebral and subclavian arteries  <input type="radio"/> carotid and subclavian arteries  <input type="radio"/> external carotid and common carotid arteries  <input type="radio"/> external carotid and internal carotid arteries                 </p>
Question 3	<p>A carotid body tumor can be identified with ultrasound as</p> <p>a.</p>

Fig. 8

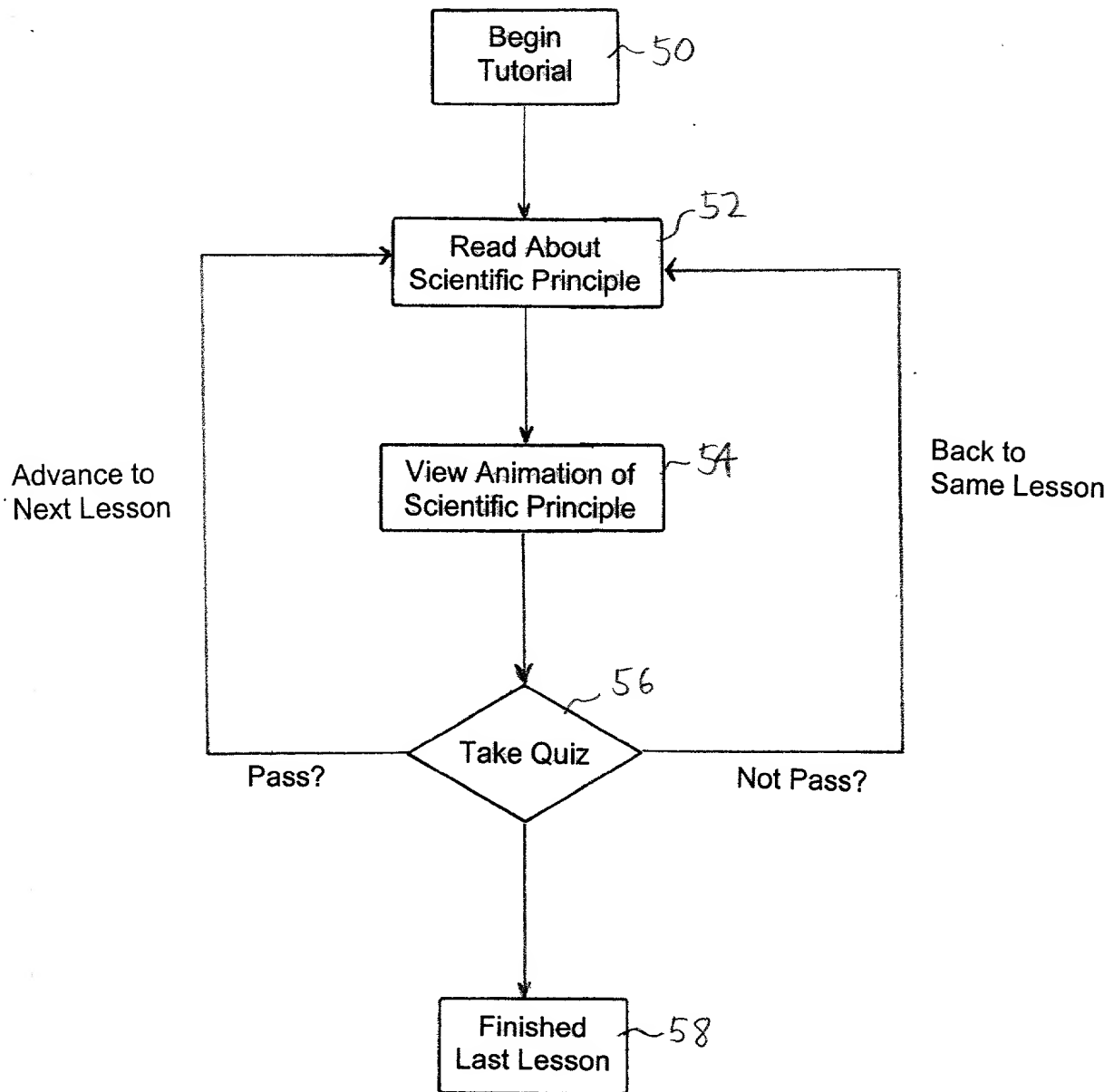


Fig. 9

Applications : Home Page - Microsoft Internet Explorer

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Address <http://learn.phcna.com/phcna/module/main.asp?mid-244&msscrid=FX2G73DP2CSR2GF40U74MQW04D79E6B>

**Doppler in Ultrasound Applications : Home Page**

OBJECTIVES OUTLINE SEARCH GLOSSARY TEST

YOUR HOME

**Doppler in Ultrasound Applications**

You have until September 12, 2004 to pass the test for this module before it expires.

### LEARNING OBJECTIVES

A concise overview of the current module.

### OUTLINE/STUDY CONTENT

Displays a listing of the topics. Please review *all* of these topics before taking the assessment test.

### SEARCH

Search by keyword or phrase.

### GLOSSARY

Vocabulary for the current module.

### ASSESSMENT TEST

Once you have studied all sections in this module, click here to take the test.



Fig. 10

## Doppler in Ultrasound Applications : Study Content

OBJECTIVES OUTLINE SEARCH GLOSSARY TEST

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### Doppler Effect

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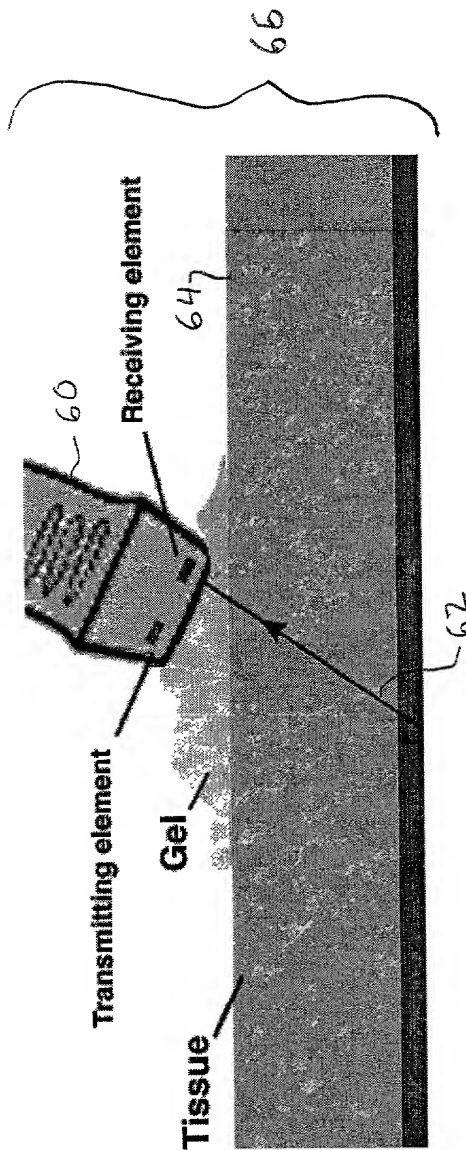
### Components of Doppler Equation

Doppler ultrasound transducers use two piezoelectric elements, one to transmit ultrasound  $F_t$  and one to listen for returning echoes from the moving blood cells  $F_r$ .

The **factor 2** is present to account for the fact that the Doppler effect actually occurs twice. The first Doppler effect occurs when the transducer is the stationary source of the sound wave and the moving blood cells are the receivers. The second Doppler effect occurs when ultrasound is reflected from the blood cells. The blood cells act as a moving source of sound waves and the transducer acts as a stationary receiver.

$v$  = the velocity of the blood (what we are trying to determine)

Fig. 11



## Doppler in Ultrasound Applications : Study Content

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### Doppler Effect

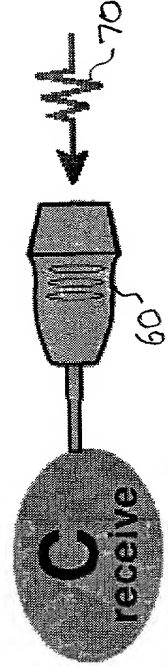
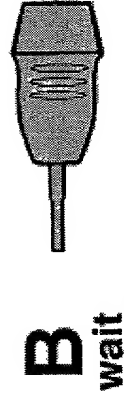
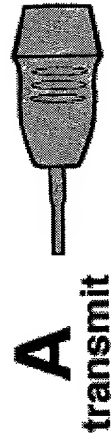
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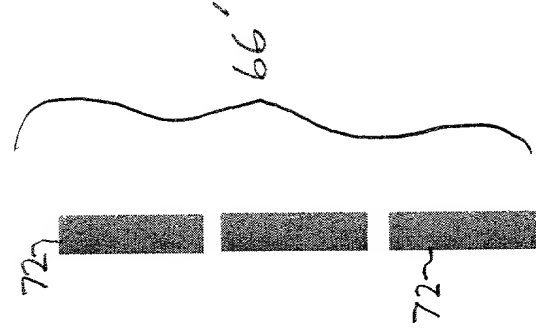
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### Pulsed Wave Doppler

Pulsed wave Doppler ultrasound uses a single piezoelectric crystal for both transmission and reception of sound waves. The system transmits short pulses of sound waves at regular intervals. It then waits for a specified time and only then receives signals from a certain depth. This is similar to pulse-echo imaging. Using this technique, the depth from which the signal originated can be calculated.



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Address <http://learn.phcna.com/phcna/module/section.asp?mid=244&sid=1060&mssid=FX2G73DP2CSR2GF400J74MQW04D79E6B>

**Doppler in Ultrasound Applications : Study Content**

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**Doppler Effect**

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Magnitude of Doppler Shift

## Quiz

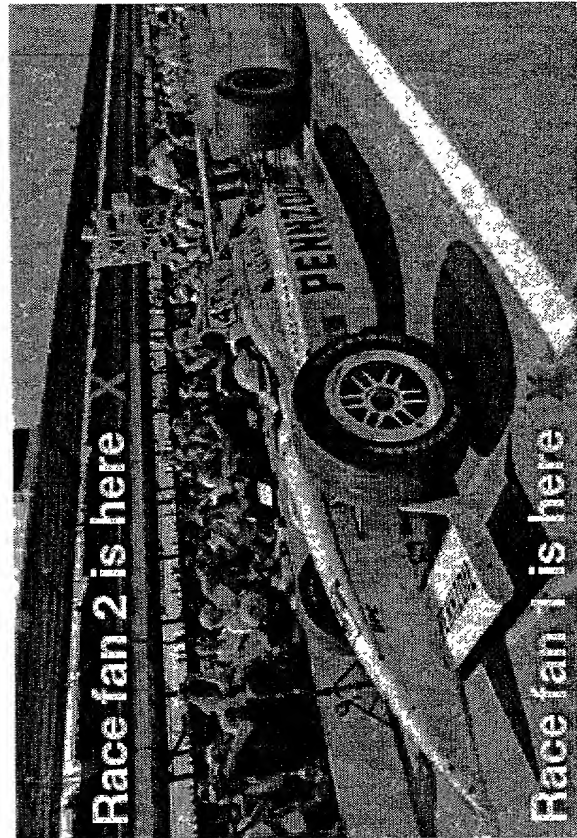


Fig. 13

## Doppler Ultrasound Signal Analysis and Optimization : Study Content

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### Analysis of Doppler Signal

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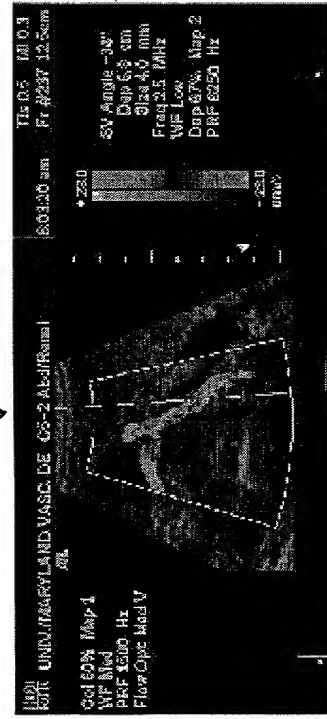
### Maximum Velocity Measurements

The Doppler equation can be used in duplex imaging to convert frequencies into velocities. This is because the angle between the Doppler beam and the blood vessel can be estimated. Analysis of the components of the Doppler waveform shows that many velocities are displayed in the spectrum and these velocities vary with time, due to the cardiac cycle.

The value most commonly used for the measurement of velocity is peak systolic flow. This is the maximum velocity in the spectrum at peak systole. Maximum velocity can also be measured at end diastole. These velocity measurements represent the fastest moving blood flow in the center of the vessel and do not include the slower moving flow near the vessel wall.

Fig. 14

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Drag the red dot into the highlighted area and drop it